

## Summer Assignment Part II

### Advanced Computer Programming AP

For the second part of your Summer Assignment, you will need to develop Java applications to solve problems presented in the following mini-projects. These will build on information learned in Pre-AP CS and your previous math/science classes. Each problem and solution code should be zipped and brought to class on the first day. LATE ASSIGNMENTS WILL NOT BE ACCEPTED. As always, please contact me with any questions. -Gruhn

1. In this assignment, you will create a program that computes the distance an object will fall in Earth's gravity.
  - a. Create a new class called GravityCalculator
  - b. Copy and paste the following initial code in the class.

```
public class GravityCalculator {  
  
    public static void main(String[] args){  
  
        double gravity = -9.81; // Earth's gravity in m/s^2  
        double initialVelocity = 0.0;  
        double fallingTime = 10.0;  
        double initialPosition = 0.0;  
        double finalPosition = 0.0;  
        System.out.println("The object's position after " +  
            fallingTime + " seconds is " + finalPosition + " m");  
    }  
}
```

- c. Run it in Eclipse (Run → Run As → Java Application)

What is the output of the unmodified program? Include this as a comment in the source code of your submission.

2. Modify the above program to computer the position of an object after falling for 10 seconds, outputting the position in meters. The formula in Math notation is :  $x(t) = 0.5 * at^2 + v_i t + x_i$ , where

a → Acceleration = -9.81

t → Time(in seconds) = 0

$v_i$  → Initial velocity = 0

$x_i$  → Initial position = 0

*Note:* The correct value is -490.5 m. Java will output more digits after the decimal place. You can use DecimalFormat class from java.text package to format your output.

3. Write and run a program that displays a table of 20 temperature conversions from Fahrenheit to Celsius. The table should start with a Fahrenheit value of 20 degrees and be incremented in values of 3 degrees. Recall that  $Celsius = (5.0/9.0)*(Fahrenheit - 32)$
4. Write and run a program that calculates and displays the amount of money available in a bank account that has \$1000 deposited in it and that earns 8% interest per year. Your program should display the amount available at the end of each year for a period of 10 years. Use the relationship that the money available at the end of each year equals the amount of money in the account at the start of the year plus 0.08 times the amount available at the start of the year.
5. A child's parents promised to give the child \$10 on her twelfth birthday and double the gift on every subsequent birthday until the gift exceeded \$1000. Write a Java program to determine how old the girl will be when the last amount is given, and the total amount she received including the last gift.
6. As a full time student, you took 4 courses last term. Write, run and test a Java program that calculates and displays your grade-point average (GPA) for the term. Your program should prompt the user to enter the grade and credit hours for each course. These should then be displayed with the lower grade first. The grade-point average for the term should be calculated and displayed. A warning message should be printed if the GPA is less than 2.0 and a congratulatory message if the GPA is 3.5 or above
7. Write a java program to find the sum of the first 100 terms in the series

$$\frac{1}{1*2} + \frac{1}{2*3} + \frac{1}{3*4} + \dots + \frac{1}{n*(n+1)}$$

Verify that the sum equals  $n / (n+1)$ . Determine the value that the sum approaches as  $n$  gets infinitely large.